Light and Lighting

Official Journal of the Illuminating Engineering Society

Incorporating "The Illuminating Engineer."

32, Victoria Street, London, S.W.1. Telephone: ABBey 5215

Vol. XL.—No. 9 September, 1947 PRICE NINEPENCE Subscription 10/6 per annum, post free

Improved Lighting in Mines

WHERE lies the Greatest Need for Improvement in Lighting?

Some people might be tempted to say, in the streets, where, even now, the available measure permitted is only half pre-war value—already far below what public safety and the needs of traffic demanded.

Yet there can surely be no question whatever of the correct answer—*in the Mines*, where increase in production is more vital than in any other field of industry, and yet the level of lighting is still so low that one wonders how work is possible.

Let us greet with acclamation, therefore, any prospect of improvement. Such a prospect we have in fluorescent lighting (See pp. 156—161), only now beginning to be used for this purpose but with great future possibilities.

A.P.L.E. Conference

These words are written as the above Conference is on the point of commencing. Particulars of arrangements and papers to be read have already been given. The gathering should be an interesting one. On this occasion there is no indoor display of lamps and lighting equipment, but instead a representative outdoor display of modern methods of street lighting. It is interesting to note that the incoming President (Mr. Thomas Wilkie) is the sole survivor still in public service of the original ten people who met and decided to form the Association in 1923. Since that date the Association has prospered greatly with a membership steadily mounting year by year.

Civic Luncheon in Liverpool

We learn with interest that the I.E.S. Liverpool Centre is arranging a special luncheon, on similar lines to that organised some time ago, which is to be graced by the presence of the Lord Mayor of Liverpool (Alderman W. G. Gregson). A feature will be an address by Mr. H. S. Magnay, M.A., Director of Education for the City of Liverpool. The luncheon is to take place at the Adelphi Hotel on Monday, October 6 (12.45 for 1 p.m.). The I.E.S. President assuming office on October 1 (Dr. J. W. T. Walsh) has accepted an invitation to attend, and no doubt there will be other leading I.E.S. members who would also wish to do so.

Evening Course at the Borough Polytechnic

In addition to the regular course for the City and Guilds of London Intermediate Examination in Illuminating Engineering conducted at the Borough Polytechnic, to which reference was made some months ago*, a special evening course has now been provided. This figures in the 1947-48 Prospectus, wherein it is described as specially suitable for those who aim at getting enrolled on the I.E.S. Register of Lighting Engineers. The course is being held on Tuesdays and Fridays from 6.30 to 9 p.m., another evening being set apart, if necessary, for tuition in ancillary subjects such as mathematics or drawing. The fee for the course is 30s. per session and enrolment was advertised to take place during September 15-17.

* Light and Lighting, June, 1947, p. 98.

Advice on Stage Lighting

It is always a mark of enterprise when those who handle light and lighting equipment go out of their way to give helpful advice to users. The more specialised and complex the application of light the more valuable are such hints from an expert.

A case in point is furnished by a little booklet, "Some Advice on Stage Lighting," intended mainly for amateur companies, and published by the Strand Electric and Engineering Co., Ltd. We may add that it is distributed *free* on demand, either from the company's headquarters in London or from its agents in Manchester, Dublin, or Glasgow.

A foreword by an actor who is also an author, Emlyn Williams, asserts the importance of lighting, giving some examples of the havoc created by lighting that is ill-directed or ill-conceived. In what follows attention is concentrated on *principles*. The booklet does not set out to be a catalogue nor to tell what type or size of lamp is needed for any particular job. But it does give a good deal of sound and practical advice, set out in a readable form.

What are the essential aims of stage lighting?

They are enunciated as follows:—

> *To illuminate the actors in such a way that their gestures, movements, and expression can be seen and appreciated by every member of the audience.*

and

> *At the same time so to illuminate the setting that this forms a credible background which will assist the actors in their interpretation of the play and add atmosphere to the production.*

This definition is carefully framed and every word in it is important. If the actor is not seen—and seen by all—he will not readily be heard. It is not always easy to achieve both these requirements individually—it may, for instance, require some skill to ensure that the effect of the lighting conforms to the apparent source—and it is certainly often quite difficult to meet both the above requirements simultaneously.

The amateur actor should not fall a victim to undue admiration of equipment. In particular he should use special lighting "effects" with discretion.

We like the final advice in the booklet, to dim down auditorium lights *gradually* whilst the footlights come slowly up to full, a sure means of putting the audience in a receptive mood and creating the desired feeling of expectancy.

A Journal of Applied Physics

One learns with interest that the Institute of Physics and the Council of the Physical Society have in mind the production of a new journal under the above title. Such a venture necessarily involves some financial risk, in addition to the various complexities, characteristic of the present time, such as are involved in getting a supply of paper and finding a printer able and willing to undertake the work. An indication is therefore being sought from members of the support likely to be given to the scheme. Those interested have in mind a quarterly journal providing about 400 pages per annum. The proposed subscription for the new journal would be £1 1s. from members of the Society and the Institute, and 30s. from non-members.

I.E.S. Forthcoming Events

On pp. 153-154 will be found the usual summary of I.E.S. meetings and events in the immediate future. We are asked to draw the attention of secretaries of centres particularly to these announcements, which appear month by month, and are based on the published programme of meetings prepared and published at the commencement of the session. It is essential, therefore, that secretaries should keep us informed of *any changes* as they occur.

I.E.S. Visit to the G.E.C. Research Laboratories

The programme of the Illuminating Engineering Society for the session 1947-48 includes a Visit to the Research Laboratories of the General Electric Company, Ltd., at Wembley on **October 28.**

This visit will take place during the course of the afternoon when visitors will be able to see work in progress in the Illumination Laboratory. The tour of the laboratories will begin at 2.30 p.m. from the main entrance in East-lane, Wembley, which is about 300 yards from *North Wembley* (L.M.S. and Bakerloo) Station. It is anticipated that the visit will be completed by 5 p.m.

The last visit to Wembley, before the war, proved extremely popular, and on this occasion, too, there will certainly be many members wishing to take part in the event.

Of necessity the number of members who can participate in this event is restricted. Application for tickets should, therefore, be made *as soon as possible* to the Secretary, the I.E.S., 32, Victoria-street, London, S.W.1.

I.E.S. Convention Proceedings

I.E.S. members generally have expressed great satisfaction with the "Convention Proceedings," now published in book form, to which attention was drawn in our last issue (p. 136). One copy of this publication was sent free to each I.E.S. member, but additional copies can still be obtained on application to 32, Victoria-street. (10s. each; six copies, £2 10s.; 12 copies, £5).

Lighting Reconstruction Pamphlets, Nos. 1-5, are also still available at a uniform rate for each pamphlet. (1s. each; 9s. dozen; £3 per 100.)

There is another important publication in prospect, the "Searchlight Symposium," to contain the complete series of papers read at the special meeting on April 15. This will be a limited edition, for which a special charge will be made.

Lighting Conferences in U.S.A.

Conferences on lighting are evidently going strong in the United States. The 42nd National Technical Conference of the American I.E.S., which is to take place in New Orleans during September 15-19, is expected to attract over 700 members and guests, including delegates from Cuba, Mexico, and South America (there are also one or two from Great Britain!). But we notice, in addition, the First Annual Cold Cathode Fluorescent Lighting Exhibit, running in New York during October 7-9, and the Second International Lighting Exposition and Conference, to be held in Chicago during November 3-7. Lighting men must be pretty busy.

Forthcoming I.E.S. Meetings

(Provisional List)

MEETINGS AND VISITS IN LONDON

1947.

Oct. 14th. Sessional Meeting. DR. J. W. T. WALSH, **Presidential Address.** (*At the School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C.*2.) **6 p.m.**

Oct. 28th. Visit to the Research Laboratories of the General Electric Company, Limited, East Lane, Wembley. (Admission by ticket only.) **2.30 p.m.**

Nov. 11th. Sessional Meeting. MR. F. WIDNALL on **The Design of Industrial Lighting Equipment**. (*At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.*2.) **6 p.m.**

Nov. 25th. Informal Meeting. PROF. H. HARTRIDGE on **Recent Advances in the Physiology of Vision.** (*At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.*2.) **6 p.m.**

MEETINGS OF CENTRES AND GROUPS

1947.

Oct. 1st. MR. E. B. SAWYER on **The Fundamentals of Illumination.** (*At Exeter.*)

Oct. 1st. Leicester Centre Annual Dinner. (*At the Bell Hotel, Leicester.*)

Oct. 2nd. Address by the Chairman (MR. E. A. NEWBURN.) (*At the Electricity Showrooms, Bath.*) **7 p.m.**

Oct. 2nd. MR. J. PEARSE and MR. R. E. EDINBOROUGH on **Hot Cathode Fittings Design and Circuits.** (*At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow.*) **6 p.m.**

Oct. 2nd. DR. W. M. HAMPTON on **Glass.** (Joint Meeting with the Institute of Physics, Manchester and District Branch,) (*At the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6.30 p.m.**

1947.

Oct. 3rd. Ladies' Night (Buffet Dance). (*At the Crown and Cushion Hotel, Perry Barr, Birmingham.*)

Oct. 3rd. Address by the Chairman (MR. J. C. CHARITY). (*At the City of Nottingham Gas Dept. Demonstration Theatre, Parliament Street, Nottingham.*) **5.30 p.m.**

Oct. 3rd. MR. S. ANDERSON and MR. E. H. PENWARDEN on **New Lighting for Old Buildings.** (*At the Electricity Showroom, Market Street, Huddersfield.*) **7 p.m.**

Oct. 6th. MR. F. JAMESON on **Shop and Store Lighting.** (Joint Meeting with the Chambers of Trade and Commerce.) (*At the Cardiff Corporation Demonstration Theatre.*) **5.30 p.m.**

Oct. 7th. Address by the Chairman (MR. E. A. FOWLER.) (*At the Leeds Corporation Electricity Dept., Whitehall Road, Leeds.*) **6 p.m.**

Oct. 9th. MR. S. ANDERSON on **Lighting of Old Buildings.** (*At the Corporation of Leicester Electricity Dept. Demonstration Theatre, Charles Street, Leicester.*) **6.30 p.m.**

Oct. 10th. Cardiff Centre Dinner Dance. (*At the Westgate Hotel, Newport.*) **7 p.m.**

Oct. 13th. MR. G. B. GIBBONS on **School Lighting.** (*At Woodthorpe Secondary School, Sheffield.*) **6 p.m.**

Oct. 17th. Address by the Chairman (MR. C. J. ALLDERIDGE). (*At the Imperial Hotel, Temple Street, Birmingham*). **6 p.m.**

Oct. 21st. DR. J. N. ALDINGTON on **The Evolution of an Electric Lamp.** (*At the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.*) **6 p.m.**

Oct. 22nd. MR. T. O. FREETH on **Lighting in the Home.** (*At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.*) **6.15 p.m.**

Nov. 3rd. MR. H. E. CARRINGTON on **Colour.** (*At the Leeds Corporation Electricity Dept., Whitehall Road, Leeds.*) **6 p.m.**

Nov. 3rd. MR. S. ANDERSON on **Cold Cathode Tubes.** (*At the Medical Library, The University, Western Bank, Sheffield.*) **6 p.m.**

(Secretaries of Centres and Groups are requested to send in particulars of any changes in programme, mentioning subject, author, place, date and time of meeting; summaries of proceedings at meetings (which should not exceed about 250–500 words) and any other local news are also welcome.)

1947.

Nov. 6th. MR. L. C. RETTIG on **Lighting and Safety in Factories.** (Joint Meeting with the Royal Society for Prevention of Accidents.) (*At the Mackworth Hotel, Swansea.*) **3.15 p.m.**

Nov. 6th. DR. J. N. ALDINGTON on **The Evolution of an Electric Lamp.** (Joint meeting with the Institution of Electronics, North-Western Branch.) (*At the Reynolds Hall, College of Technology, Sackville Street, Manchester.*) **6.30 p.m.**

Nov. 6th. Film Night. (*At Exeter.*)

Nov. 7th. Film Night—Lamp Manufacture and Street Lighting. (*At Radiant House, Bristol.*) **7 p.m.**

Nov. 7th. MR. H. G. JENKINS and MR. J. N. BOWTELL on **High Voltage Fluorescent Light Sources.** (Joint Meeting with the Institution of Electrical Engineers and the Electrical Contractors Association.) (*To be held at Messrs. Joseph Lucas, Limited, Farm Street, Birmingham.*)

Nov. 7th. DR. J. WARD on **The Application of Polarised Light.** (*At the City of Nottingham Gas Dept. Demonstration Theatre, Parliament Street, Nottingham.*) **5.30 p.m.**

Nov. 7th. MR. D. C. JAMES on **Store and Display Lighting.** (*At the Electricity Showrooms, Market Street, Huddersfield.*) **7 p.m.**

Nov. 13th. MR. A. CUNNINGTON on **Railway Lighting.** (*At the Corporation of Leicester Electricity Dept. Demonstration Theatre, Charles Street, Leicester.*) **6.30 p.m.**

Nov. 18th. MR. J. K. FRISBY on **Light for Selling.** (*At the Liverpool Corporation Electricity Showrooms, Whitechapel, Liverpool.*) **6 p.m.**

Nov. 19th. Address by the Chairman (MR. H. DICKINSON). (*At the Cleveland Scientific and Technical Institution, Corporation Road, Middlesbrough.*) **6.15 p.m.**

Nov. 20th. MR. P. CORRY on **Light and Colour in Play Production.** (*At the Bradford Corporation Electricity Offices, Sunbridge Road, Bradford.*) **7.30 p.m.**

Nov. 27th. MR. R. O. ACKERLEY and MR. ALISTER MACDONALD on **The Place of Science in the Art of Lighting.** (*At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, Glasgow.*) **6 p.m.**

Engineering and Marine Exhibition: I.E.S. Visit

The official visit of the I.E.S., with a number of other kindred bodies, to the above exhibition on September 9 proved to be a pleasant event. The I.E.S. Council was well represented and there was a general feeling that the exhibition —revived for the first time since the outbreak of war in 1939—was a wonderful effort in present circumstances. Many interesting things were to be seen, and the standard of display was, if anything, higher than ever. I.E.S. members have wide interests and appreciated the show. One wonders, however, whether, in future exhibitions, a corner could be found for some special display of lamps and equipment, as applied to navigation and the lighting of ships.

There seems to be an opportunity here for demonstrations not only of the lighting of warships and liners (where elaborate methods of illumination are often adopted), but also in merchant ships where, one fears, the lighting conditions down below often leave much to be desired.

Obituary

PROFESSOR T. DAVID JONES.

We record with regret the death, as a result of a road accident, of Professor T. David Jones, a leading authority on mining matters and head of the department of mining at Cardiff University. His advice on this subject was frequently sought, and early in the present year he visited Australia and New Zealand in this connection. Professor David Jones, who had done much research on lighting in mines, took a keen interest in the I.E.S., serving as chairman of the Cardiff centre and as their representative on the I.E.S. Council. His pleasant and kindly disposition endeared him to all and he will be greatly missed.

Wise Economy In Street Lighting

Abstract of a Contribution by Mr. L. T. Minchin to the *Contractors Record* (August 13)

In view of the present restriction of street lighting to 50 per cent. of its pre-war level, and bearing in mind that this country is likely to experience a degree of fuel shortage for some years to come, the lighting engineer should now consider the best means of using his available resources.

The 50 per cent. cut which has recently been decreed by the authorities can be effected in the following ways:—

(a) By reducing the hours of lighting;
(b) By reducing the number of lamps;
(c) By reducing the power of each lamp;

and of these the last method appears to be the wisest.

Every street lighting installation embodies some compromise between the ideal and the practicable, particularly so in the case of spacing. Really good lighting is not possible except with closely spaced lamps, and every extra 10 ft. on the spacing distance makes an installation by so much the less satisfactory. The engineer who decides to economise by cutting out half his lamps automatically doubles his spacing thereby, thus doing far more damage to the installation than would be the case were he to reduce the power of each lamp and maintain the same spacing. The main objections to putting out every alternate lamp are as follow:—

In the first place the minimum horizontal illumination between the lamps is greatly reduced, the illumination at the darkest part of the road being reduced to one-eighth of its former value. If the spacing were maintained, but the candle-power dropped, the reduction would be only one-half.

Whilst the minimum horizontal illumination is mainly of importance to pedestrians the motorist is more concerned with seeing objects in the road ahead of his vehicle. For this he uses the background provided by the streaks of light which are formed on the road by the street lamps and any other sources of light in the vicinity. Ideally these streaks should merge into a continuous bright background, but when the number of lamps is halved the gaps between the streaks are so big that the driver must use his headlamps if he is to drive safely. This may be quite satisfactory if he is the only driver on the road, but if there is much traffic in the other direction the headlamps further reduce the ability of the motorist to see what is ahead of him. If the power of the lamps is reduced the patches of light will be as numerous as before, although certainly only half as bright.

Furthermore, if a street lighting installation has been correctly planned, great attention will have been given to the correct siting of lamps, particularly at road junctions and bends. In such planning the siting of the lamps would be practically the same whether the candle-power of each lamp were 100 or 500, and a reduction in the candle-power of 50 per cent. will not affect the designer's intention, and reasonable results may still be expected. On the other hand, the extinction of every alternate lamp may have deplorable results; turnings may become obscured, and motorists may get no warning of their approach to a main road. Bends which were formerly well lighted may become death-traps.

In consequence of the alteration in the pattern of the lamps in the street caused by the reduction of the number of lamps it may also become difficult for a motorist to see the direction of the road in front of him. This is particularly important in foggy weather, when the driver often relies on the appearance of one bright patch after another to tell where he is going. There is little doubt that in this case every road user would prefer double the number of lamps at half the light output per lamp.

Unfortunately it is very much easier to cut half the lamps out of lighting than to adopt the course here advocated. In some cases reduction in the candle-power can only be effected by fundamental alterations to the lamps themselves, though in the majority of cases it can be done relatively easily without serious effect on the light distribution from each lamp.

In the present economic condition of the country much depends on the skill with which we make the best of our shortages.

Improved Lighting in Mines

The Future of the Fluorescent Lamp

By C. T. McMILLAN, D.R.T.C., A.M.I.E.E.
(*BTH Lighting Advisory Service*)

It is vital that everything possible should be done to bring coal to the surface as quickly as possible and in increasing quantities, since coal is the key to this country's economic recovery. Working conditions play a large part in individual will to work, and if we consider the miner's environment, the confined working spaces, the dirt, and more particularly, the darkness, we can appreciate the great initial disadvantage he suffers in comparison with his fellow worker in other industries. Dispel the darkness, and the miner's greatest handicap is removed; improve the seeing conditions, and his efficiency will inevitably increase.

The Need for Good Lighting

The miner is entirely dependent on artificial lighting underground, both to enable him to get to his place of work and also to carry out that work. Each man is equipped with a small cap or hand lamp, but its effectiveness is very limited, and the need for good general lighting is just as great as in any factory or workshop above ground.

At the pit bottom, where the coal tubs are marshalled, there is a constant flow of traffic, and if this is to be kept moving to avoid stoppages, good lighting must be provided. In the underground roadways illumination should be adequate, though not necessarily of a very high intensity, but it should be increased at all junctions, since these are points of greater potential danger. Loading stations should receive the same treatment as the pit bottom, since it is here that the coal from the network of coal face conveyors is transferred to tubs or main conveyors. There is, of course, an urgent need for the best possible lighting on the coal face where the coal is cut from the seam and loaded on to conveyors.

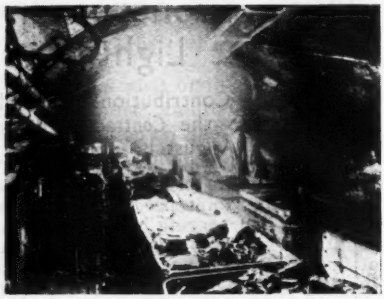


Fig. 1. Binley Colliery. Tungsten lighting at pit bottom.

Loss of coal production is frequently caused by roof falls or a breakdown in the haulage system. If defects could be noticed at an early stage remedial action might, in many instances, be taken in time to avert a stoppage. Every man becomes a potential inspector when he can see clearly.

The need for an improvement in underground lighting is recognised by the Government. The Minister of Fuel stated in the National Press on July 7, 1947, that ". . . improved lighting has a very large part to play in making for better and pleasanter conditions all round, for greater safety, greater comfort, and higher output." He also announced that a committee under the National Coal Board was studying the question of lighting at the coal face.

The Reid Report

In September, 1944, the Coalition Government set up a Committee of Mining Experts—the Reid Committee—to look into the whole question of British coal production and to recommend the best means of bringing the mines up to full efficiency. It is interesting to note their main conclusions in regard to underground lighting, published in their Report of March, 1945:—

" (I) The standard of underground lighting is too low and reacts adversely on production, safety, and health. We consider that a standard of lighting of the order of 0.4 ft.c. in the general working area should be aimed at.

" (II) As a source of illumination we

Fig. 2. Binley Colliery. New fluorescent lighting with whitewashed walls.

regard the flame safety lamp as obsolete.

" (III) The required standard of lighting at the face is unlikely to be provided by hand or cap lamps alone. A system of general lighting by power-fed lights, supplemented preferably by cap lamps, is necessary for this purpose.

" (IV) If electricity is permitted on the face there is a prima facie case for permitting mains lighting also, subject to appropriate safeguards which should be covered by General Regulations and not by Special Regulations in each case.

" (V) A higher standard of lighting should be provided outbye on roadways."

The Reid Committee, when they recommended an illumination level of 0.4 lumens per square foot, no doubt appreciated the practical difficulty of attaining standards of lighting as high as those in other industries. This illumination level is, however, comparable to the general lighting required by law for docks, wharves, railway yards, etc.

Mines (Lighting) General Regulations (1947), due originally to come into force on January 1, 1947, specify that all underground areas in which men are regularly employed shall be sufficiently and suitably lighted and that these areas shall be whitewashed. No minimum levels of illumination have yet

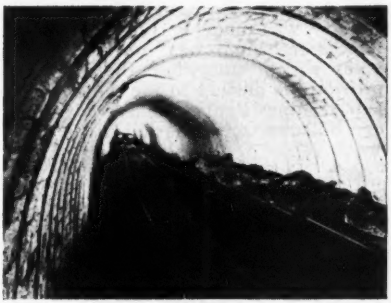


Fig. 3. Birch Coppice Colliery. Roadway lighting.

been specified. These draft Regulations also state that ". . . so far as is reasonably practicable, the lighting shall be so arranged as to prevent glare or eye-strain." Unfortunately the moment even a moderately bright light source is introduced into a coal mine, with its generally low, dark ceilings and black walls, glare will inevitably result unless special counteracting measures are taken. Whitening the roofs and walls of underground areas is one such counteracting measure, since it decreases visual discomfort while, apparently, increasing illumination.

Light Sources

With the rapid extension of the use of electricity in mines, tungsten lighting has been almost universally employed for lighting sections of underground roadways and working areas in which mains lighting is permitted by the Regulations. Lighting by tungsten lamps has only a limited success however, since the high brightness of the light-source combines with the necessarily low mounting height and the generally dark surroundings, to produce glare so strong that it greatly reduces visibility. Attempts at reducing the brightness of the light source by using frosted glass screens help to some extent, but the loss of light by absorption in the glass reduces light output which can be ill-afforded. Attempts at increasing the illumination by using higher wattage lamps only aggravates glare conditions.

The development of the fluorescent lamp during the war years led BTH lighting engineers to consider the possibility of using it in underground workings, and the first experimental fluorescent mines lighting installation in this country was made in July, 1945. The fluorescent lamp has inherent advantages which suggested that it might provide the answer to the difficult problem of mines lighting. These advantages can be summarised as follows:—

(1) Daylight colouring.

(2) Low Brightness Source.

(3) Light output about three times that of a tungsten lamp of the same wattage.

(4) Guaranteed life 2½ times to 3 times that of tungsten lamps.

(5) Its more robust cathodes are not so susceptible to vibration as tungsten filaments.

The similarity to daylight has always been a popular feature of the light from the fluorescent lamp, and the value of this property in underground workings cannot be over estimated.

A low brightness source is essential if the best seeing conditions are to be obtained, and since the surface brightness of the fluorescent lamp is in the region of only 3 to 5 candles per square inch, there is far less need for a diffusing medium, and the full output of the lamp can be utilised. Owing to the very high efficiency of the lamp, higher levels of illumination can be obtained for the expenditure of considerably less electrical energy, and the comparatively long life of the fluorescent lamp, together with its robustness, greatly reduces the number of replacements necessary per annum.

The old General Regulations restricted mains voltage for underground lighting to 125, but this permitted the use of the shorter, experimental fluorescent lamps such as the 15-watt 18-inch and 20-watt 24-inch, since they operate on 110-125 volts. The new Lighting Regulations increase the permitted voltage to an upper limit of 250. The shorter lamps, with appropriate auxiliary gear, can be adapted to this higher voltage, which also, of course, will allow the standard 80-watt and 40-watt fluorescent lamps to be used.

Fluorescent Lighting—Pit Bottom And Roadways

The first fluorescent lamps to be installed in a British coal mine were used at the pit bottom of Binley Colliery in July, 1945. Standard Mazda 80-watt 5-ft. Fluorescent Lamps were employed in Mazdalux Industrial Flameproof fittings; these fittings are not designed for use in mines but are certified for Group II gases.

In this, the first of a series of test installations, the fluorescent fittings were mounted beside existing industrial fittings, accommodating 150-watt tungsten lamps, and at approximately the same spacing. A comparison between the two installations is interesting. Although the wattage of the fluorescent lamps is considerably lower, the measured illumination is not greatly

different. There is, however, much less hard shadow under the fluorescent lamps, and the visibility between the tubs is greatly improved. The effect of whitewashing the ceiling and walls has produced a striking improvement, not so much in increased illumination as in general improvement in what can only be termed as "seeing."

The encouraging results in this preliminary experiment, showing, as they did, a very distinct improvement over existing lighting standards, led to a test installation of roadway lighting at Birch Coppice Colliery. Special 20-watt 24-in. fluorescent lamps were used in specially designed experimental fittings, spaced at approximately 45 ft. with a mounting height of 7 ft. The fittings incorporated refractor panels to spread the light output over as large an area as possible. The illumination levels, given in the form of curves in Fig. 4 show that the diversity of illumination is reasonably good, but the visual results are much better than those depicted by illumination curves or photographs. Here, again, the installation shows a great improvement over adjacent sections illuminated by tungstan lamps in well-glasses.

A similar installation using 20-watt fluorescent lamps was carried out in a drift roadway at Merry Lees Colliery; and at Crown Farm Colliery, Mansfield, 80-watt fluorescent lamps were employed at the pit bottom where the mounting height is greater than usually found. Further experiments in underground roadway and pit bottom lighting are still being made; but, from in-

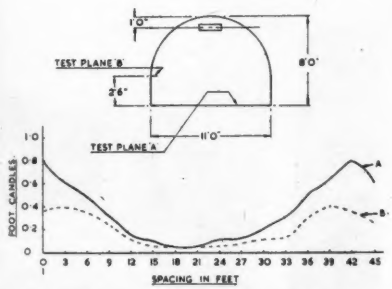


Fig. 4. Results of tests on experimental roadway installation at Birch Coppice Colliery.

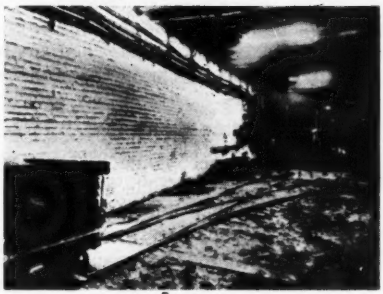


Fig. 5. Crown Farm Colliery. Pit bottom lighting.

stallations already completed, many valuable lessons have been learned.

For roadway lighting, 0.5 lumens per square foot is desirable, but not easy to obtain without close spacing of fittings. At working points, 6 lumens per square foot at tub level is practicable. With the low power consumption of the fluorescent lamp, it is considered economically possible to light long sections of roadway since, at 45 ft. spacing, the lighting load is only about 3½ kW per mile and, even if 10 miles were illuminated, the 35 kW would represent only a small fraction of the electricity consumed in a completely electrified mine.

It is interesting to note that in the Jacobi Mines in the Ruhr, producing 5,000 tons of coal per day, 15 per cent. of the electricity is consumed by the 2,000 lamps used for lighting.

In roadway installations, it may be possible to effect economies in cabling by installing fluorescent fittings with their major axes along, instead of across, the road. By using fittings with double cable entry, straight-through cabling can be employed, obviating the necessity for T-boxes. On the other hand, the illumination between fittings would be further reduced, although the projected area of the light sources to the eye would also be reduced, and this would tend to improve the visibility.

One important point to be remembered in providing well-lighted areas, is that on leaving them, and entering poorly lighted areas, it takes a little time for the eyes to become "dark adapted." The level of illumination should, therefore, be gradually reduced

either by increasing the spacing or by reducing the wattage of the lamps until the eye can become accustomed to the normal hand or cap lamp illumination.

Lighting Equipment

From experience gained, the BTH Co., Ltd., has been able to design a robust heavy duty fluorescent lighting unit of flameproof construction for use in underground roadways and working areas. This fitting is of cast aluminium alloy construction, and can be of the single or double cable entry type. A protective armoured glass encloses the lamp, and the auxiliary gear is ready wired in the back channel. Tests have so far shown that, in normal conditions the fluorescent lamp is inherently safer than the tungsten lamp, and will not ignite fire damp on fracture, but behind each lampholder is a safety switch which, in the rare event of the lamp being fractured will automatically cut off the power supply, and with this protective device and the armoured glass, the fitting is suitable for use in mines. The design of this Mazdalux Mines Lighting Fitting is common to the various lamp size units, the only variable being the length of the cast back channel.

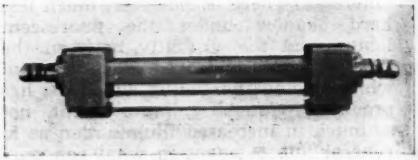


Fig. 7. Mazdalux underground roadway fluorescent lighting fitting.

Fluorescent Lighting at the Coal Face

Coal face lighting from electric mains is not at present permitted in this country, although it was strongly recommended in the Reid Report. It is possible that, as a result of investigations now being carried out by the National Coal Board to determine the best form of lighting at the coal face, regulations will be passed permitting coal face lighting from electric mains. An experiment in coal face lighting using 15-watt 18-inch fluorescent lamps was carried out by the BTH Co., Ltd., at Birch Coppice Colliery, early in 1946, and it is now giving very promising results. The experimental fittings form part of a continuous cable system, and are spaced at 12-foot centres, suspended from props as close to the roof as possible. Pairs of fittings are permanently joined, and successive pairs connected together with cable couplings. These fittings incorporate semi-circular reflectors which also act as a protective shield for the lamp outer glass during shot firing. These reflector shields can be turned through 180 deg. in order to illuminate the goaf side opposite the

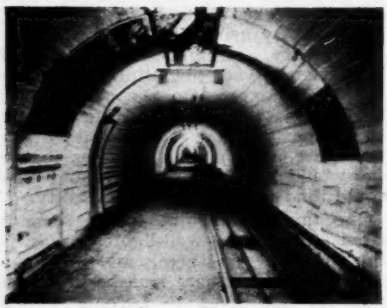


Fig. 6. Merry Lees Colliery. Drift roadway lighting.

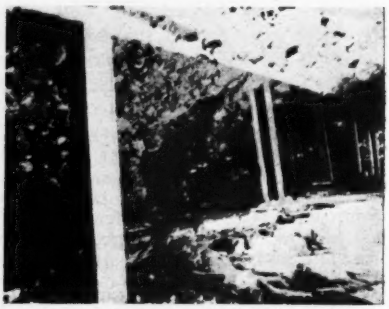


Fig. 8. Fluorescent lighting at the coalface, Birch Coppice Colliery.

coal face when packing is being carried out on the afternoon shift.

The great difficulty with coal face lighting is the mechanical handling of the equipment, which must be moved forward daily, together with the other plant, as the coal face is cut away. This, however, is a problem of internal organisation, but it means that lighting equipment must be portable, easily connected, and of the most robust finish to withstand these arduous conditions.

A Committee on Coal Face Lighting has been formed under the chairmanship of Mr. Richard Crawford, Chief Electrical Engineer of the National Coal Board and, under the auspices of this committee, arrangements have been made for sections of the coal face in several collieries to be lighted with fluorescent lamps. These test installations, some of which are to be carried out with BTH equipment, will be used by the Scientific and Medical Sections of the N.C.B. for investigating the effect of improved lighting upon the health and psychological condition of miners, and it will also be interesting to note the results which are achieved in relation to output.

The application of the fluorescent lamp to mines lighting has made it possible to provide working conditions underground which, a few years ago, would only have been a far-off dream. Improvements in lighting will form part of the great programme of reorganisation, and will go a long way towards reducing the great disparity between conditions in the factory and conditions underground.

Fluorescent Lighting for Bournemouth Roundabout

Lansdowne roundabout, Bournemouth, which is lit by 80w. Osram 5-ft. fluorescent lamps, is believed to be the first roundabout in the country using this type of lighting.

The installation comprises 25 single-lamp cut-off reflector lanterns on brackets on trolley-bus poles, and was installed by C. Coffin, Public Lighting Superintendent, under the direction of W. C. Clowes, the Borough Engineer and Surveyor.

The lanterns are of G.E.C. design and embody cut-off distribution which, together with the low brightness of the light source, provides complete freedom from glare, at the same time furnishing lighting which approximates closely to daylight.

An aerial view of Lansdowne roundabout, Bournemouth, lit by 5 ft. 80-watt fluorescent lamps.

The average illumination is 3-ft. candles, although readings as high as 4—5-ft. candles were obtained at various points on the kerb.

Public Lighting In Sheffield

The tenth report of the public lighting engineer for Sheffield, Mr. J. F. Colquhoun, covers the complete period 1939-1947, within which no annual reports were issued. It contains the usual summary of work performed and the graphs and diagrams showing results for successive years. The number of lamps and the total candle-power available have (theoretically) mounted year by year, and the cost of lighting service and candle-power per head of population, after a big drop during the war period (when there was virtually no lighting) is now back to normal. The Sheffield Illumination Society has now 69 members, all employees of the Lighting Department.

The report recalls the very dangerous conditions that prevailed in the streets during the early period of the war, when a total black-out was in force. The subsequent "star-lighting," meagre as it was, was much appreciated by the Sheffield public. At the same time all lights were very effectively shielded, so much so that a flight-lieutenant, after making inspection from above, found difficulty in believing that 25,000 lighted lamps were actually in use.

The report concludes with a chronological account of changes and regulations which illustrate the vicissitudes to which the Lighting Department was subjected (and to which, one may gather, it stood up remarkaby well). Starting with blackout exercises in 1938 and 1939, it proceeds to total extinction of all public lamps on September 1, 1939, which prevailed until February, 1940, when star-lighting was installed. Thereafter the next change was in September, 1944, when the improved so-called "moon-lighting" (an increase from 0.0002 to 0.02 ft.-c.) was permitted. Finally—a big event—full peace-time lighting was restored in July, 1945.

This, unfortunately, was not the end of the story. Before very long cuts in the interest of fuel economy were ordered, a condition which prevails up to the present month, when a return to 50 per cent. of pre-war lighting has at length been permitted.

Photo-Electric Exposure Meters

It is admittedly difficult to frame precise rules and instruments for determining photographic exposure. Such devices are necessarily based on **average brightness** and in some subjects the actual variation in brightness may be great. In practice slightly different procedures are often recommended in applying exposure meters to different subjects. It is, however, all the more necessary that meters should be based on common principles and approved standard design. The British Standards Association, through the Photographic Industry Standards Committee, has now completed and published a specification on this subject (Photo-Electric Exposure Meters, B.S. 1383, 1947. Price 2s. net post free). This deals very fully with the essential design of such apparatus and should help greatly towards uniformity in this field.

E.L.M.A. Lighting Design Courses

We have received a prospectus of the Central England Area Illumination Design Course arranged by the E.L.M.A. in Birmingham during September 22-25. This comprises some 14 talks by experts on different phases of lighting. We understand similar courses are being arranged in Manchester, Stoke-on-Trent and Sheffield—as well as a special one-day course in Coventry.

Alexander Pelham Trotter

Some Personal Recollections

by

J. T. MacGREGOR-MORRIS, D.Sc., M.I.E.E., F.I.E.S.

An account appeared in the August issue of "Light and Lighting" (p. 143) of the general activities of the late A. P. Trotter, and of some of his characteristics. Perhaps it might interest some of your readers, were I to add some more personal touches, having had the privilege of knowing him for nearly fifty years.

He had a logical mind and, like Michael Faraday, was keen to try out for himself any new inventions. He experimented at Trinity College, Cambridge, with the new Graham Bell receivers in 1877 (the actual year when the first published account appeared) having made a pair himself — and obtained clear though faint speech across the quadrangle. Then again, many years later, when wireless reception was coming to the front, he made up his own set and obtained good results at a time when many younger men had not enough confidence to attempt such novel work.

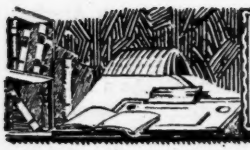
In the August number of your issue you have already mentioned the I.E.S. Committee tests on flares and star-shells, of which committee Trotter was chairman. It was about 1915 that the first outdoor tests were made, and these were carried out in an open space behind the Royal School of Mines, Exhibition Road. If my memory serves me correctly, in addition to Trotter and myself, there were Edgcumbe, Clinton, Blok, and Dow, and possibly others who took part in the tests. A police officer was told off to give us some official status. After dark shell flares were ignited, and very rough time-readings were made on photometers. We heard later that Woolwich Arsenal, seeing the illumination of the clouds over South Kensington, thought that an enemy raid had started! As a result we were sent to Tooting Common, and later did extensive tests at Stonebridge Park. It was there that the "alphabetical column" photometer was developed by Trotter, Clinton, and others which he described in "The Illuminating Engineer" in December, 1918.

One of Trotter's characteristics was his strong dislike of official red-tape, and this was shown in many ways. As an example, he told me once that the Physical Society of London represented the closest approximation to his ideal for a scientific society because of its reduction to a minimum of formalities. It was this desire for freedom that prompted his pungent statement in "Who's Who" about his recreation.

He spoke French fluently, and he and his wife often went to visit M. Blondel in Paris. They had much in common as both Trotter and Blondel had independently developed the diopetric method of distributing light from a source for street lighting and similar purposes.

After his retirement to Teffont, near Salisbury, he rejoiced to have visits from his scientific friends, and he particularly felt the loss some years ago of Mr. Crowley. However, he could not be dull, having many hobbies. He was clever with his hands, making simple scientific toys and many beautiful things —mainly in wood—in his workshop. He had studied the art of printing, and had his own printing press. Some poems of his wife's he printed, and bound them and several other books in quite professional style. He also took a keen interest in village handicrafts.

We have lost a pioneer and a true friend. He would have been an ornament to the Royal Society, but he was the last man in the world to seek for honours.



REVIEWS OF BOOKS AND PUBLICATIONS RECEIVED

Textbook of Illuminating Engineering, by J. W. T. Walsh. (Sir Isaac Pitman and Sons, London, 1947; pp. 185; figs. 135. Price 17s. 6d.)

There has long been a need for a work of this nature, i.e., a *textbook* for students of illuminating engineering, and the need has been accentuated by the initiation of the City and Guilds Examination, for which students enter each year in increasing numbers.

The task imposes considerable self-discipline on the author. In the limited space at his disposal he must aim at giving students all they certainly need to know; but he cannot afford to dilate on topics on which he has special knowledge or in which he is personally interested.

This test the author passes with flying colours. The book bears evidence of careful planning as well as efficient execution. To wide knowledge of subject matter Dr. Walsh adds a gift for lucid exposition. The text is clear, the paper and printing good, and the diagrams, of which there is a generous number, well selected and executed.

The contents of the book are determined by the requirements of the Intermediate Examination of the City and Guilds of London Institute, for which they serve as a preparation. There are accordingly three chapters devoted to the production of light and its effect on the eye, and two others concerned with light measurement. Subsequently Chapters VI to VIII deal with daylight and illuminants, Chapters IX and X with light distribution and design. It was a happy thought to include in a final chapter some account, necessarily brief, of the supply of energy (gas and electric) for lighting. A useful feature is the series of specimen examination questions and answers at the end of the volume, and at the beginning there is a table of abbreviations and symbols.

Luminous Tube Lighting, by H. A. Millar; Second Edition. (Geo. Newnes, Ltd., London, 1947; pp. 171; figs. 104. Price 12s. 6d. net.)

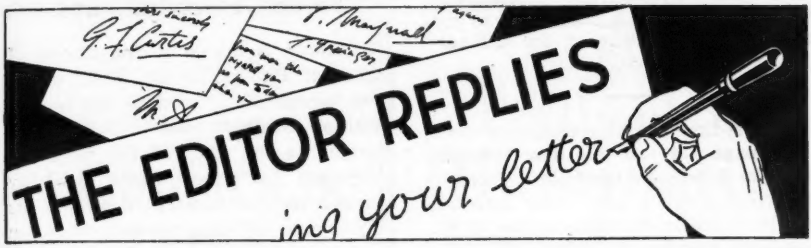
The second edition of this work, which has been previously reviewed in these columns,* has been considerably extended, notably by the addition of a final chapter on High Voltage (Cold Cathode) Fluorescent Lighting. The remark made in connection with the first edition—that the author deals with the construction and performance of luminous tubes rather than their application for purposes of illumination—again applies. But with this reservation it covers a wide field and contains a great deal of miscellaneous information. The new chapter, with its data on circuits and operation, will be found of interest, and Chapters 8 and 9 ("Data and Tests" and "Neon Signs") contain much tabular data; for example, on combinations of tubes giving coloured light. The order and general arrangement of matter is not always happy, and one still seems to miss any detailed account of the qualities and performance of the 5-ft. fluorescent lamp—the most commonly used of all fluorescent sources at the present time.

Also received:—

The Highway Engineer's Reference Book. (Geo. Newnes, Ltd., London, 1947; pp. 456. Price 30s.)

A useful reference book for county and municipal engineers and others, containing a section on the Lighting of Streets and Roads.

* Light and Lighting, Sept., 1945, p. 134.



As will be gathered from the notice on page 164 the long expected **textbook on illuminating engineering,** by Dr. J. W. T. Walsh, has now made a welcome appearance. Those who have been inquiring for it can now obtain copies—but should not delay their application too long. In spite of the difficulties attending publication of books in this country, Dr. Walsh's book has, after all, come out ahead of the corresponding American textbook. But the latter, by all accounts, is a much more elaborate production.

My attention has been drawn to a complaint from a correspondent to the daily Press, who asks how much longer travellers on the Underground are to suffer from the effects of **extinguishing lamps at intervals in coaches**—a device that can surely only lead to a microscopic saving in fuel.

Without accepting the statement that trying to read in these circumstances is "ruining the eyes" of passengers, one can endorse the **irritation and inconvenience** that this practice causes. It is quite noticeable how passengers select by preference the seats under the lights (though certainly at rush periods they are glad to get any seat!)

In the meantime one cannot help daily observing another field for true economy. There are heavy **arrears of maintenance and decoration** to be made up. One would not care to guess at the efficiency of some of the lamps in use (whose performance, one suspects, is sometimes still further and most uneconomically prejudiced by under-running). When one occasionally hits on a carriage in which fittings have been thoroughly cleaned and new lamps inserted the effect is magical.

One gets opportunities, too, of realising how much **light normally received by reflection** off walls and ceilings is being lost by long neglect. This is particularly true of **escalators,** so many of which are lighted by indirect means. Observation of one escalator with a recently whitened ceiling fully confirmed the immense difference that this makes to the illumination.

Fluorescent lamps continue to excite interest in the House of Commons. Mr Shinwell informed Mr. Sorensen that the ordinary filament lamp consumes three to eight times as much coal as a discharge lamp—rather a loose statement, for it is rarely that coal consumption goes exactly hand in hand with consumption of electricity, as is so commonly assumed.

Mr. Shinwell further explained, on the authority of the Minister of Supply, that the demand for lamps of the latter type exceeded the supply, and that he was

actively encouraging their development. He did not consider it practicable to prohibit the manufacture of the ordinary filament lamp (*sic.*).

A short time ago we commented (June 1947, page 114) on two **new reflector-units for fluorescent lamps** introduced by Benjamin Electric Ltd. Our attention has been drawn to other similar developments, amongst which may be noted six new 40-W fluorescent industrial fittings, announced by Philips Electrical Ltd. Three are of the single and three of the "two-lamp" type. All feature detachable reflectors of opal "Perspex" or enamelled steel, alternative mountings, easy installation and maintenance. All are offered complete with apparatus, already wired.

One is glad to note the tendency to make use of opal "Perspex" and similar materials. Whilst almost everyone seems to appreciate the nature of the illumination afforded by fluorescent lamps, objection is sometimes taken to their appearance. There seems to be a growing feeling this is improved and softened by the use of diffusing translucent material.

Personal Notes

Mr. W. J. C. Davey has severed his connection with Elm Works, Ltd., though he will continue to assist them in an advisory capacity. Mr. Davey is now acting as a street and factory lighting engineer and technical publicity consultant from his address at 30, Queensway, London, W.2.

Mr. C. L. Kent has been appointed London office representative of the Wardle Engineering Co., Ltd., at 34, Victoria-street, London, S.W.1 (Tel.: Abbey 4072 and 1356) in succession to the late Mr. Gunner.

"Philips Electrical, Ltd."

Attention is drawn to the change of names of Philips Lamps, Ltd., which, from September 1 onwards has become **"Philips Electrical, Ltd."** Behind this change lies the story of the rapid development of the small company founded in this country in 1925. Its output now includes not only lamps in many varieties (tungsten, discharge and fluorescent), but also radio equipment, medical and industrial equipment of many types, etc. Over 11,000 people are employed by the company in its factories, offices, and research laboratories in this country. The new name, therefore, is better adapted to the very wide range of activities of Philips Electrical, Ltd., though to readers of this journal the name is naturally most closely associated with lamps.

Recent Patents

No. 588,707. Improvements in Gaseous Electric Discharge Tubes with Fillings comprising a Main Rare Gas and an Auxiliary Gas or Vapour. (*Société Pour Les Applications De L'Electricite et Des Gaz Rares-Etablissements Claude-Paz and Silva. March* 11, 1939. *Convention, Switzerland.*)

The specification covers an electric discharge tube containing a rare main gas and a slight proportion of an auxiliary gas. Normally in such tubes the auxiliary gas, which is added to lower the starting potential, disappears rapidly from the tube atmosphere. This invention makes use of the prenomenon of gas storage by solid substances which are introduced into the tube and ensure low starting voltage during a long, useful life.

No. 589,037. Improvements relating to Electric Lighting Systems. (*Siemens Electric Lamps and Supplies, Limited, and Aldington, J. N. June* 15, 1945.)

The specification covers a system of electric lighting in which there is a diminution of the expenditure of electrical energy to produce a given apparent illumination. The system takes advantage of the phenomenon of persistence of vision and includes a fluorescent lamp which derives its energy from a capacitance so connected as to be charged from a source of direct current to a peak voltage less than the fundamental breakdown voltage of the lamp. Means are provided whereby rapidly recurring impulses (more than 24 per second) of high voltage may be applied to the lamp causing a high current density discharge of short duration.

No. 589,121. Improvements in Illuminating Devices for Sewing Machines. (*W. W. Triggs. June* 3, 1946.)

The device consists of an incandescent electric lamp and a shade. The shade containing the lamp is a case-part detachably secured to the front face of the sewing head. Light from the lamp is directed only on to the working plane.

No. 589,240. Improvements in Electric Discharge Lamps. (*The General Electric Company, Limited, and Francis, V. J., and Nelson, E. H. September* 18, 1944.)

This specification covers a gas-filled high-pressure electric discharge lamp wherein the distance between the termination of the discharge is less than the distance of the termination from the envelope of the lamp, and comprising a plurality of anodes associated with a single cathode. The lamp is adapted to operate on direct current, and the invention is especially advantageous when the dissipation of energy is 10 kW or more, at which rate an anode, consisting of a single tungsten cylinder, becomes overheated, thereby reducing the useful life of the lamp.

No. 589,467. Electric Discharge Tubes. (*Lumalampen Aktiebolag. March* 21, 1945. *Convention, Sweden.*)

The specification covers an electric discharge tube of diffuse discharge characteristic with gas and/or vapour filled designed to emit light by luminescence. The tubular envelope has at each end a coiled incandescent electrode, the lead-in wires of which are sealed in a radial direction directly to the longitudinal wall of the envelope. Fluorescent material is provided both on the longitudinal wall and at the closed ends of the tube which participate in the radiation conversion.